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ABSTRACT

Despite sharp declines in the number of farms, farmers, and land in agriculture in the U.S. Northeast, total agricultural production is still big business there. Yet, significant shifts have taken place in the specific types of location where the various products are being produced. Moreover, these shifts have latent effects on the organization, structure and quality of community life. Although average market value of all agricultural products sold is increasing in approximately the same absolute size in all types of the 300 Northeastern U.S. counties (metropolitan, suburban, urban, and rural), only dairy and livestock products have remained constant. Crops have disproportionately shifted to the more suburban and poultry to the more rural counties. A factor analysis of the 10 agricultural indicators showed that average market value of agricultural products sold, median farm family income, and market value of poultry typified the clusters of the 196 non-metropolitan Northeast counties. Hence, they (along with percentage of land in agriculture) were used as the indicators of a viable agriculture. The hypothesis tested is that a viable agriculture contributes positively to various aspects of quality of community life in these counties. Detailed correlation analysis shows that, indeed, as indicated by average market value of agricultural products sold and by median farm family income, a viable agriculture contributes to viable community life. (Author/JC)

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August 1979

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ABSTRACT

Despite a sharp decline in the number of farms, farmers, and land in agriculture in the U.S. Northeast in recent decades, total agricultural production is still big business there, and has been growing in terms of total value. On the other hand, significant shifts have taken place in the specific types of location where the various products are being produced. Moreover, these shifts have latent effects on the organization, structure and quality of life in the communities within these counties. Although average market value of all agricultural products sold is increasing in approximately the same absolute size in all types of the 300 Northeastern U.S. counties (metropolitan, suburban, urban, and rural), only dairy and livestock products are still found in approximately the same proportions in all county types during the last two decades. Crops have disproportionately shifted to the more suburban counties, and poultry to the more rural counties. Such findings are reasonably consistent with the regional economic rationale of increased transportation costs of farm products under conditions of approximately equal rates of increase in demand for all types of products. A factor analysis of the ten agricultural indicators showed that average market value of agricultural products sold, median farm family income, and market value of poultry typified the clusters of the 196 non-metropolitan Northeast counties. Hence, they (along with percentage of land in agriculture) were used as the indicators of a viable agriculture. The hypothesis tested in the last part of the study is that a viable agriculture contributes positively to various aspects of quality of community life in these counties. Detailed correlation analysis shows that, indeed, as indicated by average market value of agricultural products sold and by median farm family income, a viable agriculture contributes to viable community life. Goldschmidt's hypothesis for his two California communities, therefore, is probably not a social scientific fluke, but also holds for the 196 counties of the Northeast.

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Everyone knows that the structure of U. S. agriculture has changed drastically in the last half century. The general statement to cover these changes is "Fewer farms with the help of high technology innovations produce more food on less land." These changes, of course, have differential impacts on rural communities (cf. Rodefeld, et al., 1978, passim.). Few studies since Goldschmidt (1946), however, systematically document the effects of specific agricultural variables on a wide range of community structures and resources (cf. Rodefeld, et al., 1978, Ch. 3). The present study documents the agricultural changes occurring in Northeast U. S. counties, and then relates these changes to a broad spectrum of community characteristics in the counties.

The basic hypothesis guiding this study is taken from Goldschmidt's (1946) lead, namely, that there is a positive interaction between viable agriculture and viable community life. The definition of a viable agriculture here follows that of Goldschmidt (1946, 1978), and refers to a larger percentage of land remaining in agriculture, a greater farm product, higher farm income, and more farms producing the product. Viable community structure and process is more difficult to characterize in a short statement, but includes at least attention to participation and competition in local

political life, more differentiation in services to the local population, more socio-economic resources to be distributed among the local population, more equitable distribution of these resources, and "better" readings on generally accepted indicators of personal and social well-being such as less poverty and unemployment, fewer suicides and homicides, less infant mortality, more sound housing, and so forth (cf. OMB, 1976; Eberts, 1979). Although causation is difficult to establish in these relations, at minimum a set of positive correlations is expected between indicators of viable agriculture and indicators of viable community life.

I. Agricultural Changes in the U.S. Northeast. Agriculture is sometimes looked upon as an undifferentiated mass phenomenon. In reality, of course, agriculture is highly differentiated--at least by type of product, type and size of operation, type of ownership, and access to markets. Moreover, changes in these aspects of agriculture are induced by a variety of market and nonmarket forces. At the least, a study of changes in agricultural structure must differentiate between the types of products produced, types of operations, and types of localities from which the agricultural products are produced.

Table 1 presents one way of observing these changes by showing the changes in various indicators of agricultural structure for the 300 counties of the Northeastern United States (from Maine to Maryland, with West Virginia as the western boundary), by type of county for the years 1949, 1959, and 1969. The data for this table come from the agricultural censuses of those years. The four types of counties specified in the heading of the table represent an attempt to differentiate between places characterized by different combinations of urban and rural activities. In some ways, these

Table 1. Mean Scores on Agricultural Indicators for Counties of the U.S. Northeast, by County Type, 1949, 1959, and 1969.

		County Type*			
	(N=)	Rural (117)	Urban (79)	Suburb (47)	Metro (57)
1. Total Acres Harvested (1,000)	1949	46.2	76.5	73.0	67.3
	1959	39.6	64.0	59.9	55.5
	1969	33.4	53.2	48.4	46.8
2. Percent of Land in Agriculture	1950	47.7	46.0	47.4	34.1
	1960	41.8	40.4	41.6	30.1
	1970	28.4	29.0	31.4	20.9
3. Total Number of Farms (With 3+ Acres)	1949	1432.0	2027.9	1984.0	2095.9
	1959	908.5	1303.3	1251.1	1247.0
	1969	541.4	767.4	779.1	737.9
4. Average Acres Per Farm	1949	131.6	114.9	89.8	76.6
	1959	166.4	143.9	112.6	101.0
	1969	202.9	174.6	134.6	123.9
5. Median Farm Family Income	1949	-	-	-	-
	1959	3984.8	4929.6	5620.6	5754.4
	1969	7139.3	8644.1	9726.9	9598.0
6. Market Values of All Agricultural Products Sold ($1000)	1949	4666.5	8645.5	9935.4	11128.2
	1959	5489.8	9989.8	10994.9	11130.1
	1969	7866.2	12967.1	13430.4	15000.6
7. Dairy Products ($1000)	1949	1957.8	3483.9	3308.1	3320.9
	1959	2592.0	4657.3	4196.4	4125.3
	1969	3512.6	5806.2	4907.2	5068.0
8. Crops ($1000)	1949	665.5	2350.4	3460.4	3734.3
	1959	1022.6	3004.5	4613.8	4253.4
	1969	1204.4	3053.1	5495.5	5027.6
9. Livestock and Livestock Products ($1000)	1949	669.9	938.8	1240.6	1335.7
	1959	790.2	1168.2	1627.9	1556.1
	1969	927.7	1455.4	1800.1	2316.3
10. Poultry and Poultry Products ($1000)	1949	1325.2	1769.3	1850.9	2899.5
	1959	1536.3	1951.0	1372.7	2847.3
	1969	2301.8	2017.6	1153.9	3146.0

* Cf. definition in text.

four county types are assumed to "cause" differentiated agricultural structures in them.

A metropolitan county is one which contains a central city of 50,000 or more and a total population of 100,000 or more, and which has an official designation of metropolitan status by the U.S. Census for the year 1970. A suburban county is officially designated by the U.S. Census as one which is contiguous to a metropolitan area and which sends 15 percent or more of its labor force outside the county for employment. A county is here designated urban if it has a central city between 10,000 and 50,000 in population size and does not meet the other criteria for suburban or metropolitan status. A rural county is one which does not meet any of the above criteria, that is, does not contain a central city of 10,000 or more, does not send 15 percent of its labor force across the county boundaries for employment, and does not have any other designation. As can be seen from the number of cases in each classification, this method of categorizing counties gives a large enough distribution of cases in each of the four county types in order to make statistically significant generalizations. Thus, data aggregated at these levels can both be reasonably trustworthy as well as interpretatively meaningful.

The data in the body of Table 1 give an overview of the changes in these indicators of agricultural structure during the last two decades. The trends are largely the familiar ones. The number of total acres harvested is declining in all four county types. The percentage of land in agriculture is declining. The total number of farms is declining. The average number of acres per farm is increasing. Median farm family income is increasing. The market value of all agricultural products sold is increasing. Dairy, crop, livestock, and poultry products are also all increasing in market value.

Despite these familiar trends, Table 1 also contains some surprises. For instance, despite metropolitan pressures on land use, Northeast metropolitan counties have nearly as much land in agriculture as their suburban counties. Moreover, these metropolitan counties have more acres in harvest than rural counties. In fact, Table 1 shows that Northeast rural counties lag behind all other county types on all these agricultural indicators except market value of poultry.

Perhaps this anomaly--that rural counties are the least agricultural--appears because many of the Northeast rural counties as defined above (not adjacent to a metropolitan area, and with no population center exceeding 10,000) are actually mountainous, and in this day of agricultural surpluses given over to forest and mining operations rather than agriculture. It is the urban counties which are actually the most agricultural, at least in terms of total acres harvested. Indeed, it is probable that urban counties' population centers of 10,000 or more historically exist primarily due to the agricultural viability of these counties, even if today there are other facilities which also contribute to their export base.

In addition, suburban counties may have been expected to become the breadbasket (as well as the bedrooms) of people living in metropolitan counties; and this, apparently, has happened to some extent in the Northeast in the last two decades. Although more acres have gone out of production in suburban counties in the last two decades than out of any other type of county, Northeast suburban counties still have a greater percentage of land left in agriculture than any other type, have more farms, larger farm family incomes, and more income due to crops. Indeed, it appears that they are both bedrooms and breadbaskets of their metropolitan neighbors, while the more rural counties are either too distant or their land is too poor for them to provide the same types of services to the large population markets of the metropolitan and suburban counties.

Furthermore, the urban, suburban, and metropolitan counties have had the greatest number of acres harvested in all three time points, while they have simultaneously suffered greater declines in the total number of harvested acres. In the Northeast as a whole between 1949 and 1969, an average of 23,000 acres per county has gone out of agriculture for the 79 urban counties, 25,000 acres in suburban counties, and 21,000 acres in metropolitan counties, while only 13,000 acres have gone out of production in rural counties.

The Northeast metropolitan counties show somewhat of a surprise in this regard. The indicator of Market Values of All Agricultural Products Sold shows that metropolitan areas are not simply places for producing manufactured and other non-agricultural goods. These data show that even the most industrialized Northeast metropolitan counties on the average (but this average does not include the absolutely non-agricultural counties of the very largest metropolitan centers, New York City, Philadelphia, Washington, and so forth) have the largest total agricultural dollar product, the largest in livestock and poultry products, and are second in crop and dairy production. The suburban and urban counties, of course, are close behind the metropolitan counties on all these indicators, but the rural counties lag far behind (except possibly in poultry).

In any case, rural counties in the U.S. Northeast are much less agriculturally oriented, and the other three types of counties are much more agriculturally oriented, than the myths of the pervasive and negative effects of urban-industrial complexes on agriculture may otherwise lead us to believe.

Such a finding, of course, fits into the traditional theory of regional economic development (cf. Isard, 1975). This theory posits that one reason most metropolitan areas are large today is because they

had good agricultural land and agricultural product to start with, and that this good agricultural land permitted them to develop enough surplus (along with other things such as "break of bulk" terminals and availability of sites for industrial growth) so that a larger population size was possible in them. The ultimate consequences of these changes are that the agricultural surpluses produced enough profits that investments in other types of industries would then be possible (cf. also Richardson, 1973). Such a processual phenomenon is apparent in the data of Table 1 in terms of the Market Value of All Agricultural Products Sold. It shows a simple gradient from the metropolitan through the suburban and urban counties to the rural counties. This gradient, of course, parallels the one of Distance from Metropolitan Counties (which is sometimes called County Metropolitan Status). Central place theory and agglomerations of scale based on technological innovations (more land intensive rather than land extensive agriculture) also are part of this general economic theory of regional growth and development (cf. Isard, 1975; Richardson, 1973). Farms in metropolitan counties must be very profitable or they could not survive the competition with other forms of metropolitan land use.

Data for the major specializations in Northeast agriculture--dairy, crops, livestock, and poultry--are presented for the county types in indicators 7, 8, 9, and 10 of Table 1. It is clear from these data that different types of counties specialize in different agricultural products. Although each type of county has reasonably good diversity in agricultural product, urban counties are on the average the largest producers of dairy products; suburban counties specialize in crops; metropolitan counties today specialize in livestock and in poultry. Rural counties do not demonstrate any comparative advantage, being the lowest in all types

of specialization except poultry where they are behind only the metropolitan counties.

It is important to note that on these indicators the levels of specializations have increased since 1950. The range (or gap) between the highest and lowest county type on the total value for each product is larger in 1969 than it was in 1949. For instance, the average gap for dairy products between rural counties and urban counties in 1949 was $1500 ($3483.9 minus $1957.8) while in 1969 it was $2300 ($5806.2 minus $3512.6). Likewise, the gap in crops in 1949 was $3 00, while in 1969 it was $4200; the gap in livestock in 1949 was $700, while in 1969 it was $1400; and the gap in poultry in 1949 was $1400, while in 1969 it was $2000. Thus, despite the fact that each type of county still has a diversity of agricultural product, each continues on a trend toward concentration in particular products.

A final observation on Table 1 concerns the size of farms and the total number of farms. On the average, rural counties in the Northeast have the smallest number of farms, but the largest amounts of acreage per farm. Metropolitan counties on the average have the smallest size farms, along with the largest amount of total agricultural product (in dollar terms). In fact, there is a gradient of farm size, increasing from metropolitan through suburban to the urban and rural counties. Suburban counties generally have the largest number of farms, but they are not much different from the urban and metropolitan counties in this regard.

Several interpretations of these data are possible. First, farming in rural counties must be land extensive in order to be profitable. Second, the land in the more rural counties is possibly less fertile so that more land is needed in order to produce enough to make commercial

farming viable. Thus, it could be that farms in rural counties are larger because they engage primarily in land extensive types of agriculture, either due to the lack of fertility or because the types of product they are producing is itself land extensive. For instance, raising livestock initially requires large amounts of grazing land, and fruit operations can utilize large plots of land not suitable for other forms of agriculture.

In summary to this section, the data in Table 1 definitely show some trends in Northeast agriculture which might affect quality of life in the communities in these counties. On the surface, rural counties look the least advantaged with regard to a variety of indicators of agricultural viability. They have fewer acres harvested, less percentage of land in agriculture, fewer but larger farms, less farm family income, less total agricultural product in dollar values, least in dairy, crops, and livestock products and are in the middle on poultry products. Moreover, with regard to many of these indicators this situation has been getting comparatively worse since 1950 even as total product indicators have risen--that is, the "richer" agricultural counties have been getting richer faster than the "poorer" agricultural counties. The gap between the richer and poorer counties has been increasing, just as the specialization in agriculture has been increasing. In any case, it is clear that agriculture is not a mass phenomenon whereby the agricultural situation is essentially the same from one county to another. Agriculture has been changing consistently depending upon the type of county under consideration. And rural counties more than others have been taking the brunt of the negative changes.

Let us now turn to examine the extent of the correlations between these different types of changes.

II. Relations Among Agricultural Structural Indicators. The trends analyzed above have hinted at some of the interrelations among agricultural structure indicators. Still, more formal techniques of correlation analysis should be performed on these indicators in order to further document the extent of the validity of the above generalizations, and to select the key agricultural indicators to be used in our analysis with community indicators in the next section of this study.

Table 2 presents the intercorrelation matrices of the agricultural indicators for all 300 Northeast U.S. counties, and for the 196 non-metropolitan (urban and rural) Northeast U.S. counties for 1970. Both matrices are included here in order to compare the two sets for possible divergences. As can be seen from perusing the two matrices, they are remarkably similar. The vast majority of the signs are the same, and even the sizes of coefficients are close to one another. Some differences do exist in certain indicators, however, such as in the coefficient of market value of poultry, and in percent of land in agriculture, where seven of the nine coefficients are smaller for the 196 counties than they are for the 300 counties.

A second observation about Table 2 is that certain variables show high correlations and hence cluster with each other, while other variables appear more independent from the others. Particularly, and somewhat surprisingly, median farm income appears quite independent from the other variables, while average market value of agricultural products sold appears quite interrelated with a number of other variables. Other lower correlated variables include market value of poultry, average farm size, and percent of land in agriculture.

A common technique for demonstrating interrelations between indicators is to use factor analysis. Thus, the indicators from Table 2 were submitted to orthogonal varimax rotations, first for all 300 counties, and then for

Table 2. Intercorrelation Matrix of the Ten Agricultural Structure Indicators, Northeast Counties, 1969.

300 NE US Counties Agricultural Structure Indicators	Agricultural Structural Indicators									
	1	2	3	4	5	6	7	8	9	10
1. Avg. Mkt. Value Ag. Products Sold, 1969	1.0									
2. Mkt. Value Livestock, 1969	.77	1.0								
3. Mkt. Value Dairy, 1969	.65	59	1.0							
4. Mkt. Value Crops, 1969	.65	.34	.18	1.0						
5. Mkt. Value Poultry, 1969	.45	.24	.09	.21	1.0					
6. Total Acres Harvested, 1969	.82	.58	.71	.44	.38	1.0				
7. Number of Farms, 1969	.81	.74	.72	.47	.21	.86	1.0			
8. Avg. Farm Acres, 1969	-.03	-.05	.23	-.24	-.11	.13	.01	1.0		
9. Median Farm Family Income, 1969	.22	.08	.17	.33	.17	.11	.07	-.34	1.0	
10. Percent Land in Agric., 1969	.41	.36	.44	.22	.44	.57	.57	.30	-.07	1.0
196 NE US Counties	1	2	3	4	5	6	7	8	9	10
1. Avg. Mkt. Value Ag. Products Sold, 1969	1.0									
2. Mkt. Value Livestock, 1969	.63	1.0								
3. Mkt. Value Dairy, 1969	.57	.75	1.0							
4. Mkt. Value Crops, 1969	.65	.36	.15	1.0						
5. Mkt. Value Poultry, 1969	.43	.03	-.06	.26	1.0					
6. Total Acres Harvested, 1969	.85	.66	.63	.57	.34	1.0				
7. Number of Farms, 1969	.75	.76	.66	.47	.11	.84	1.0			
8. Avg. Farm Acres, 1969	.04	.08	.27	-.15	-.15	.14	.01	1.0		
9. Median Farm Family Income, 1969	.31	.19	.31	.36	.11	.20	.12	-.20	1.0	
10. Percent Land in Agric., 1969	.41	.59	.39	.34	-.06	.49	.55	.20	.04	1.0

the 196 non-metropolitan counties. The orthogonal varimax rotation gives a relatively stable and replicable set of loadings (correlations of indicators with factors), compared to other types of factor analysis (cf. Rummel, 1970). As is also traditional, all factors with an Eigenvalue over 1.0 are reported.

Factors are normally defined, identified, or "named" by the highest loading indicators on each factor. In Table 3 and 4 the highest loading indicators for each factor are marked off by boxes. As can be readily observed by comparing the indicators in each box of each factor across the three years within each table, the factors are very similar from one decade to the next. Thus, the first factor for all three years includes market value for livestock, and for dairy, and average market value of agricultural products sold, as well as number of farms and total acres harvested. In addition, market value of crops tends to be consistently correlated with the factor in the .40 to .59 range, and due to this consistency can probably be considered a part of the factor. Percent of land in agriculture is also seen as related to the factor in certain periods, but does not show quite the consistency as that demonstrated by market value of crops.

Since the Northeast is heavily into dairy farming, and livestock is often associated with dairy herd culling and veal production, and since many dairy farmers also engage in extensive harvesting of corn and grain for their herds, and hence show a large number of total acres harvested, it is understandable that most of these indicators fit in the same factor. In addition, the initial idea of Goldschmidt that viable agriculture will also include a larger number of farms is supported by these data.

Tables 3 and 4 contrast with each other, however, in the rest of their factor structures. Table 3, on all 300 Northeast counties, contains

Table 3. Orthogonal Varimax Factor Analysis of Agricultural Structure Indicators, 300 Northeast U.S. Counties, 1949, 1959, 1969.

1949	Factor I	Factor II
Avg. Market Value of Products Sold, 1949	.930	-.327
Total Acres Harvested, 1949 ($1000)	.889	.236
Number of Farms, 1949 ($1000)	.826	.069
Market Value of Livestock, 1949 ($1000)	.771	.111
Market Value of Dairy, 1949 ($1000)	.759	.472
Market Value of Crops, 1949 ($1000)	.593	-.522
Market Value of Poultry, 1949 ($1000)	.478	-.605
Average Farm Acres, 1949	.082	.466
Percent of Land in Agriculture, 1950	.398	.386
Eigenvalue	4.39	1.68
Percentage of Variance Explained	48.7	18.6
1959		
Total Acres Harvested, 1959	.953	.175
Avg. Market Value of Products Sold, 1959	.943	-.292
Number of Farms, 1959	.910	.029
Market Value of Livestock, 1959 ($1000)	.745	-.024
Market Value of Dairy, 1959 ($1000)	.696	.262
Market Value of Crops, 1959 ($1000)	.559	-.417
Percent of Land in Agriculture, 1960	.512	.491
Market Value of Poultry, 1959	.419	-.327
Average Farm Acres, 1959	.101	.634
Median Farm Family Income, 1959	.058	-.500
Eigenvalue	4.69	1.93
Percentage of Variance Explained	46.9	19.3
1969		
Avg. Market Value of Products Sold, 1969	.959	-.218
Number of Farms, 1969	.929	.090
Total Acres Harvested, 1969	.904	.107
Market Value of Livestock, 1969 ($1000)	.738	-.033
Market Value of Dairy, 1969 ($1000)	.735	.242
Percent of Land in Agriculture, 1970	.543	.379
Market Value of Crops, 1969 ($1000)	.519	-.419
Median Farm Family Income, 1969	.167	-.439
Average Farm Acres, 1969	.045	.679
Market Value of Poultry, 1969	.310	-.226
Eigenvalue	4.65	1.74
Percentage of Variance Explained	46.5	17.4

Table 4. Orthogonal Varimax Factor Analysis of Agricultural Structure Indicators, 196 Northeast Non-Metropolitan Counties, 1949, 1959, 1969.

1949	Factor I	Factor II	Factor III
Total Acres Harvested, 1949	.946	-.075	-.102
Avg. Market Value Products Sold, 1949	.881	.456	.100
Market Value Livestock, 1949 ($1000)	.825	-.428	.053
Number of Farms, 1949	.768	-.025	.029
Market Value Dairy, 1949 ($1000)	.746	-.383	.017
Market Value Crops, 1949 ($1000)	.473	.645	-.600
Market Value Poultry, 1949 ($1000)	.324	.578	.622
Percent of Land in Agriculture, 1950	.410	-.264	.099
Average Farm Acres, 1949	.231	-.245	-.124
Eigenvalue	4.25	1.64	1.01
Percentage of Variance Explained	47.2	18.2	11.2

1959			
Total Acres Harvested, 1959	.967	.011	-.014
Average Market Value Products Sold, 1959	.881	.464	.009
Number of Farms, 1959	.861	.023	-.099
Market Value Dairy, 1959 ($1000)	.796	-.355	.437
Market Value Livestock, 1959 ($1000)	.784	-.334	-.025
Percent of Land in Agriculture, 1960	.533	-.364	-.290
Market Value Crops, 1959 ($1000)	.445	.487	-.149
Market Value Poultry, 1959 ($1000)	.278	.457	-.130
Median Farm Family Income, 1959	.053	.310	.516
Average Farm Acres, 1959	.211	-.291	-.039
Eigenvalue	4.51	1.70	1.08
Percentage of Variance Explained	45.6	17.0	10.8

1969			
Total Acres Harvested, 1969	.916	.046	-.210
Avg. Market Value Products Sold, 1969	.898	.257	-.166
Number of Farms, 1969	.877	-.133	-.102
Market Value Livestock, 1969 ($1000)	.814	-.259	.118
Market Value Dairy, 1969 ($1000)	.743	-.364	.345
Percent of Land in Agriculture, 1970	.561	-.255	-.034
Market Value Crops, 1969 ($1000)	.579	.404	-.095
Market Value Poultry, 1969 ($1000)	.224	.452	-.286
Median Farm Family Income, 1969	.329	.512	.665
Average Farm Acres, 1969	.086	-.397	-.033
Eigenvalue	4.68	1.64	1.04
Percentage of Variance Explained	46.8	16.4	10.4

only two factors, while Table 4, on the 196 non-metropolitan counties, contains three factors. Moreover, these remaining factors shift from decade to decade within both of the tables. For the 300 county analysis, average farm acres appears to have the highest loading, although the 1949 data show market value of poultry having the highest loading. Perhaps the shift in these data captures the movement of poultry from comparatively rural settings in 1949 to more metropolitan settings in 1969 (as seen in Table 1), while simultaneously larger farm size appears in the more rural counties.

For the 196 non-metropolitan county analysis in Table 4, factors II and III also shift from decade to decade. Part of the reason for this shift is that the indicator of median farm family income was available only for the 1959 and 1969 analysis. Its inclusion is important because it turns out to show consistently the highest loading on factor III for both 1959 and 1969. In 1949, when the median farm family income indicator was not available, market value of crops and poultry are found in both factors II and III in a curious combination--both are positively loaded in factor II, and one is positive and one is negative in factor III. This situation probably indicates the dual location of poultry production in 1949--both crops and poultry were probably located in more rural, less wealthy counties in 1949 as indicated in factor II, and poultry was also found, to a lesser extent, in the more wealthy and dairy counties in factor III.

In any case, for the 196 non-metropolitan counties, the first factor indicates greater agricultural production in total, dairy, livestock, acres harvested, and number of farms, the second factor is a poultry factor, and the third is median farm family income. In addition, percent of land in agriculture and, in 1959 and 1969 the value of crops, are

reasonably highly correlated with the first factor. Average farm acres is not highly correlated with any of the factors in any time period, which indicates that farm size is reasonably randomly distributed in relation to these other variables (cf. also Table 2).

On the basis of these findings, therefore, the remainder of the analysis will be limited to using four indicators of farm structure, and to the sample of 196 non-metropolitan counties. Since the major issue in the remainder of the analysis is to give further test to the Goldschmidt hypothesis that viable agricultural structures are interrelated to viable community structures, it seems reasonably important to separate out the influences of metropolitan areas. Thus, the 196 non-metropolitan counties will represent the data set on which further tests will be conducted.

Average market value of agricultural products sold will be chosen to represent factor I. Naturally a factor score was produced and could be used, but in some ways the score is less clear in its interpretation than is a single indicator. Moreover, the factor score also tends to give the same results as a high loaded indicator (cf. Eby, 1972). Average market value of agricultural products sold is only the second highest loaded indicator on factor I, following total acres harvested, but it seems to have a face validity as an indicator of viable agriculture and as a summarizing indicator over the other indicators loaded into the factor--it summarizes the effects of dairy, livestock, and crops which are also highly correlated with the factor. Moreover, it should be noted that number of farms is also highly and positively correlated with this factor, which gives initial support to the Goldschmidt (1946) hypothesis that a larger number of farms is positively correlated with a more viable and productive agriculture. It is possible, however, that an ecological effect is working here, namely, that the agricultural land

in the counties is comparatively good enough to support a large number of farms and a productive agriculture. The fact that median farm family income is not part of the factor, however, gives further indirect support to the notion that a larger number of smaller farms may, in fact, be more productive in total agricultural production in a set of counties than a fewer number of larger farms in similar types of counties.

The second indicator to be used in further analysis will be median farm family income. Despite its lack of redundancy with factor I, it is the highest loaded indicator on factor III, and it does have face validity as an indicator of viable agriculture. Moreover, it appears to be more highly correlated with the other indicators of viable agriculture in 1969 (a loading of .329) than it did in 1959 (a loading of only .053). Hence, there may be a trend that viable agriculture is becoming more associated with more wealthy farm family income so that higher loadings will be noted when they become available for the more recent years. In any case, median farm family income will also be used as an indicator of viable agriculture in the further analyses with community structure indicators.

A third indicator, market value of poultry, will also be used in further analysis, largely because it consistently appears as related to factor II and is independent of the previous indicators. Since this indicator relates to only one commodity, however, it should probably not be conceived of as an indicator of viable agriculture as a whole, but only of one agricultural industry. Its relations to indicators of community structure, therefore, may be quite different from those of the previous two indicators.

The final indicator to be used in further analysis will be percent of land in agriculture. This indicator is used primarily because it is not clearly related to any of the previous factors, and because it has

been used so frequently as a general indicator of agricultural dynamics. Its ready availability in the County-City Data Book has probably contributed to its wide usage as an indicator of agricultural structure, and its interrelations should be compared to those of other indicators. From its face value, as well as its reasonably high correlations with factor I, it can be assumed that this indicator will be another indicator of agricultural viability, and hence correlate positively with indicators of viable community structure.

At least three of these four indicators, then, should correlate highly and positively with indicators of viable community structure if the Goldschmidt hypothesis is correct that viable agriculture helps to contribute to viable community structure. Let us now turn to the analysis of data related to this hypothesis.

III. Agricultural Structure and Community Structure. The major purpose of this study is to bring systematic data to bear on the hypothesis that a viable agriculture in counties will positively correlate with indicators of viable community. Naturally, considerable discussion could also be extended on the nature of the indicators of viable community. A detailed discussion of the indicators used below is presented elsewhere (cf. Eberts, 1976, 1977, 1979), so that only a summary will be given here.

There seems to be a consensus that viable community life is a product of a number of dimensions of activities in the community (cf. OMB, 1973, 1976). The economic base must be diverse and growing (cf. Isard, 1975). Local services must be differentiated and increasing (cf. Warren, 1963). The political sector must be participatory and competitive (cf. Clark, 1973). Educational, occupational, and income resources must be large and increasing (cf. Fox, 1974). The distribution of these resources

must be relatively more equal (cf. Gans, 1968). Public expenditures should be large and increasing (cf. Clark, 1973). And social and personal well-being must be high (cf. OMB, 1973, 1976).

Of course, multiple indicators are necessary to capture each of these dimensions of community life. Tables 5 and 6 present some of the most commonly used indicators for each of the general concepts, as well as their correlations with our chosen indicators of viable agriculture for 1950, 1960, and 1970, for the 196 non-metropolitan Northeast counties. As noted above, data from the 196 non-metropolitan counties are used in this part of the analysis in order to reduce the effects of the large metropolitan centers in the Northeast.

The most outstanding fact about Table 5, which presents the correlations for average market value of agricultural products sold and for median farm family income, is that so few negative correlations are observed. Moreover, most of the negative correlations are present because of the nature of the community structure indicators. For instance, the Gini coefficient of income inequality, the percent of poverty families, the percent unemployed, and per capita suicides, homicides, and infant mortality, all require negative coefficients in order to show a positive effect of viable community with viable agriculture. Indeed, 17 of the 24 correlations with these indicators do show these effects, even if 12 are statistically insignificant at the .05 level. (A correlation of .08 or more is generally statistically significant with 196 cases at the probability of .10 level, and .10 or more is statistically significant at the .05 probability level.)

The major negative findings in Table 5 are found with the economic base indicators of percent in mining and percent commuting, as well as with the political process indicator of percent participating in

Table 5. Correlations of Key Indicators of Viable Agriculture with Indicators of Viable Community, 196 Northeast U.S. Counties, ca. 1950, 1960, and 1970.

Indicators of Viable Community Life		Indicators of Viable Agriculture: Avg. Mkt. Value Ag Products Sold 1949	1959	1969	Median Farm Family Income 1959	1969
LOCAL PUBLIC AND PRIVATE ECONOMIC BASE						
1. Diversity of Economic Base	1950,1960,1970	.00	.24	.27	.21	.10
2. No. Public Admin. Employees	1950,1960,1970	.40	.40	.28	.41	.47
3. No. Mfg. Units 100+ Employees	1950,1963,1967	.31	.31	.27	.51	.46
4. P.C. Value Added, Mfg.	1950,1960,1967	.25	.29	.20	.60	.34
5. No. Top 200 Corporations	1950,1960,1964	.20	.23	.23	.43	.43
6. Total College Enrollment	1950,1960,1970	.12	.11	.09	.31	.33
7. % Mining	1950,1960,1970	-.31	-.31	-.30	-.32	-.44
8. % Finance, Ins., Real Estate	1950,1960,1970	.22	.20	.14	.47	.23
9. % Commuting	1950,1960,1970	-.13	-.14	-.20	.11	.04
10. Transportation Scale	1950,1960,1970	.36	.24	.17	.20	.21
LOCAL SERVICE DIFFERENTIATION						
11. Commercial Services Scale	1950,1960,1970	.21	.22	.26	.27	.34
12. Medical Specialties Scale	1950,1960,1970	.22	.32	.22	.43	.46
13. Mass Media Communications Scale	1950,1960,1970	.20	.26	.21	.41	.26
LOCAL PUBLIC POLITICAL PROCESSES						
14. No. of Elected Officials	1952,1957,1967	.12	.15	.14	.02	-.02
15. % Voting (Participation)	1952,1960,1968	-.03	-.15	-.29	-.23	-.26
16. Two Party Competition	1952,1960,1968	-.12	.01	.03	.09	.03
LOCAL RESOURCES						
17. Population Size	1950,1960,1970	.39	.41	.31	.50	.51
18. Median Family Income	1950,1960,1970	.26	.31	.29	.91	.87
19. Median School Yrs. (Education)	1950,1960,1970	.10	.27	.25	.61	.67
20. % Professional, Technical in Labor Force	1950,1960,1970	.12	.13	.13	.53	.55
21. Median Age	1950,1960,1970	.21	-.01	-.21	.13	-.32
22. Population Density	1950,1960,1970	.10	.12	.06	.48	.47
LOCAL EQUALITY						
23. Gini Coefficient of Income (Inequality)	1950,1960,1970	.06	-.24	-.10	-.70	-.39
24. Affluency/Poverty Ratio	1950,1960,1970	.24	.22	.17	.79	.70
25. Equality (1 - % Affl. - % Poverty)	1950,1960,1970	.11	.29	.19	.82	.25
LOCAL PUBLIC AGENCIES AND BUDGETS						
26. Total Per Capita Expenditures	1957,1966,1972	.24	.23	.36	.29	.53
27. P.C. Exp's. - Education	1957,1966,1972	.19	.19	.36	.19	.48
28. P.C. Exp's. - Welfare	1957,1966,1972	.19	.16	.36	.12	.38
29. P.C. Exp's. - Health & Hospitals	1957,1966,1972	.05	.05	-.02	-.11	.29
30. P.C. Exp's. - Police	1957,1966,1972	.16	.12	.10	.49	.65
31. P.C. Exp's. - Highways	1957,1966,1972	.25	.27	.24	.20	.29
32. No. Local Gov't. Employees	1957,1966,1967	.44	.43	.32	.47	.52
33. Public Planning Scale	1960,1966,1970	.28	.34	.27	.43	.48
DISRUPTED PERSONAL & SOCIAL WELL-BEING						
34. % Poverty Among Families	1950,1960,1970	-.21	-.32	-.32	-.89	-.75
35. % Unemployed	1950,1960,1970	-.06	-.16	-.28	-.45	-.53
36. % Disrupted Marriages	1950,1960,1970	.03	-.02	.06	-.19	.27
37. % Sound Housing	1950,1960,1970	.30	.32	.27	.80	.65
38. P.C. Suicides	1950,1960,1967	.10	-.12	.03	--	--
39. P.C. Homicides	1950,1960,1967	-.06	-.03	.02	--	--
40. P.C. Infant Mortality	1950,1960,1967	-.06	-.04	.00	--	--

Table 6. Correlations of Key Indicators of Viable Agriculture with Indicators of Viable Community, 196 Northeast U.S. Counties, ca, 1950, 1960, and 1970.

Indicators of Viable Community Life		Indicators of Viable Agriculture: Percent Land in Agriculture 1949	1959	1969	Market Value of Poultry ($1000) 1949	1959	1969
LOCAL PUBLIC AND PRIVATE ECONOMIC BASE							
1. Diversity of Economic Base	1950,1960,1970	.12	.35	.34	.02	.08	-.33
2. No. Public Admin. Employees	1950,1960,1970	-.02	-.03	-.02	.26	.24	.00
3. No. Mfg. Units 100+ Employees	1950,1963,1967	-.05	-.04	.00	.19	.15	-.02
4. P.C. Value Added, Mfg.	1950,1960,1967	-.02	.04	.07	.17	.17	-.06
5. No. Top 200 Corporations	1950,1960,1964	-.05	.01	.04	.13	.07	-.02
6. Total College Enrollment	1950,1960,1970	-.03	-.06	-.07	.03	.01	-.05
7. % Mining	1950,1960,1970	-.21	-.23	-.27	-.15	-.17	.36
8. % Finance, Ins., Real Estate	1950,1960,1970	-.13	-.06	-.05	.14	.12	.00
9. % Commuting	1950,1960,1970	.14	.07	.12	--	-.01	-.07
10. Transportation Scale	1950,1960,1970	-.08	-.07	-.05	.15	.09	-.05
LOCAL SERVICE DIFFERENTIATION							
11. Commercial Services Scale	1950,1960,1970	-.01	.06	.05	.05	.03	.07
12. Medical Specialties Scale	1950,1960,1970	.10	.05	.07	.04	.11	-.06
13. Mass Media Communications Scale	1950,1960,1970	.00	-.03	.02	-.01	.06	-.04
LOCAL PUBLIC POLITICAL PROCESSES							
14. No. of Elected Officials	1952,1957,1967	-.01	.01	.07	--	.02	.05
15. % Voting (Participation)	1952,1960,1968	.01	-.14	-.18	.07	-.13	-.03
16. Two Party Competition	1952,1960,1968	.16	.11	.18	.08	.14	-.06
LOCAL RESOURCES							
17. Population Size	1950,1960,1970	-.08	-.07	-.06	.18	.19	.01
18. Median Family Income	1950,1960,1970	-.19	-.14	.03	.04	.08	-.09
19. Median School Yrs. (Education)	1950,1960,1970	-.25	-.22	-.07	-.01	.04	-.18
20. % Professional, Technical in Labor Force	1950,1960,1970	-.13	-.13	-.02	.03	-.01	-.14
21. Median Age	1950,1960,1970	-.01	.02	-.07	.16	.09	-.04
22. Population Density	1950,1960,1970	.01	-.04	-.04	.12	.11	-.01
LOCAL EQUALITY							
23. Gini Coefficient of Income (Inequality)	1950,1960,1970	.37	.21	.05	.10	.00	.14
24. Affluency/Poverty Ratio	1950,1960,1970	-.09	-.13	.03	.08	.08	-.05
25. Equality (1 - % Affl. - % Poverty)	1950,1960,1970	-.33	-.18	-.04	-.05	.03	-.09
LOCAL PUBLIC AGENCIES AND BUDGETS							
26. Total Per Capita Expenditures	1957,1966,1972	-.13	-.09	.05	-.01	.02	-.04
27. P.C. Exp's. - Education	1957,1966,1972	.06	.08	.05	-.04	.00	.00
28. P.C. Exp's. - Welfare	1957,1966,1972	-.07	-.02	.18	.00	.00	-.03
29. P.C. Exp's. - Health & Hospitals	1957,1966,1972	.03	.02	.06	-.04	-.08	-.05
30. P.C. Exp's. - Police	1957,1966,1972	-.27	-.25	-.16	.14	.15	.00
31. P.C. Exp's. - Highways	1957,1966,1972	-.14	-.09	.10	-.03	.00	-.05
32. No. Local Gov't. Employees	1957,1966,1967	-.03	-.04	-.04	.17	.18	.00
33. Public Planning Scale	1960,1966,1970	-.05	-.04	.00	.07	.12	-.04
DISRUPTED PERSONAL AND SOCIAL WELL-BEING							
34. % Poverty Among Families	1950,1960,1970	.26	.15	-.07	.00	-.06	.10
35. % Unemployed	1950,1960,1970	-.07	.01	-.13	-.10	-.12	.02
36. % Disrupted Marriages	1950,1960,1970	-.08	.01	-.02	.04	.13	.04
37. % Sound Housing	1950,1960,1970	-.10	-.01	-.01	.09	.10	-.18
38. P.C. Suicides	1950,1960,1967	.04	.05	-.03	--	--	--
39. P.C. Homicides	1950,1960,1967	-.03	-.07	.05	--	--	--
40. P.C. Infant Mortality	1950,1960,1967	.09	.08	-.01	--	--	--

presidential elections by voting. Most of these are large enough to be statistically significant. Mining and commuting, however, have been shown elsewhere to be disruptive economic bases (cf. Kerr and Siegel, 1954; Seeley, Sim, and Looseley, 1963), and percent voting is noted also to be an inconsistent indicator of viable political process (cf. Clark, 1973). Moreover, the ecological correlation of rough terrain associated with mining may keep agriculture from gaining viability. In addition, a lack of any viable local economic base, including agriculture, may force people in some counties to commute.

In other words, the correlations in Table 5 give strong support to the Goldschmidt hypothesis that viable agriculture is highly and positively correlated with viable community. It is the rare correlations with these sets of indicators which are unexpected or even insignificant. Moreover, it is interesting that so many of the correlations for the three years are so close in size. This would seem to indicate a relative stability of this hypothesis through time.

The story using the two agricultural indicators in Table 6, however, is quite different. First of all, Table 6, displaying percent of land in agriculture and market value of poultry, is filled with negative and/or insignificant correlations. Only 72 of the 229 coefficients reach statistical significance at the .05 level. Only 8 of the 40 for percent of land in agriculture in 1970 reach significance, and of these 3 are in the unexpected direction. Likewise, only 7 of the 37 correlations with market value of poultry for 1969 are significant at the .05 level, and of these 6 are in the unexpected direction. The strong (.36) correlation of poultry and mining for 1969, whereas it had been -.15 and -.17 for 1949 and 1959, would seem to indicate that the poultry industry has moved from more urban type places to more rural type places

in the later decade. Thus, the poultry industry probably is locating in places that are less viable in their community structures.

The contrast between the two sets of indicators given in Tables 5 and 6, therefore, is quite striking. Counties with viable agriculture as indicated by average value of agricultural products sold and by median farm family income certainly have a variety of viable community structures, whereas counties which simply have large percentages of their land in agriculture, or which have relative specialization in the poultry industry, do not have nearly as much viability in their community structures.

A key issue of course is whether these correlations indicate causation, and, if so, whether the causation moves from agricultural viability to community viability or vice versa. Because of the multiplicity of indicators involved, such an issue is difficult to assess. Because of the notion of multiple and circular causation between these variables, however, we can assume that viable agriculture undoubtedly makes some contribution to viable community, but there is probably also no question that viable community makes for a viable agriculture. Since there are multiple indicators of community structure, the regression analyses necessary to demonstrate the importance of agriculture are massive. Still, it should be noted that, because the vast majority of the correlations between average market value of agricultural products sold and the community structure indicators are positive and less than .40, there is very little collinearity between the two sets of indicators. In addition, there are a great many significant correlations between them. Thus, it can be reasonably assured that the average market value of agricultural products sold (or its fellow indicators in factor I) will have independent effects on community structure, and that Goldschmidt's hypothesis will be upheld in further regression analysis.

The issue is less clear with the indicator of median farm family income. Its correlations in Table 5 show considerable problems of collinearity with a number of community structure variables. It is correlated .87 with median family income, .67 with median school years completed, .56 with percent professional-technical-kindred, .51 with population size, .70 with affluency/poverty ratio, .53 with total per capita government expenditures, -.75 with families in poverty, -.53 with percent unemployed, and .65 with percent of sound housing. Obviously, then, those counties with higher or lower median farm family incomes are very collinear with a number of important community structure variables. To sort it out from these variables in regression analysis, therefore, would be next to impossible. It is part of one or more clusters of important community indicators. Techniques other than regression analysis using counties as units must be employed. Still, it is part of the general income cluster, and not separate from it.

In essence, then, this study gives additional support to Goldschmidt's hypothesis that a viable agriculture will be significantly important in affecting a viable community structure, which also makes the obverse true, that, where agriculture is less viable, non-metropolitan communities are also likely to be less viable.

IV. Conclusions. Our general conclusion is that, on the basis of systematic data on a variety of indicators over the last two decades from the 196 non-metropolitan counties in the Northeastern part of the United States, a more viable agriculture is indeed correlated with, and probably at least to some degree causative of, a more viable community life in these counties.

In arriving at this conclusion, we examined some of the major trends in a set of ten indicators of agricultural structure in the Northeast,

subjected these indicators to a factor analysis in order to determine which indicators typify the clusters formed and should be used in further analyses, and then intercorrelated them with a set of indicators of viable community life. The agricultural indicators included those on farm size, number of farms, acres harvested, percentage of land in agriculture, median farm family income, and values of crops, dairy, poultry, livestock, and total. The community indicators included those from the export base sector, the local service sector, the political sector, the public agency sector, the local socioeconomic resources sector, the distributive sector, and the personal and social well-being sector. The large number of positive and significant correlations between the average market value of all agricultural products sold--which typifies a cluster including number of acres harvested, number of farms, and the values of dairy, livestock and crops--and a variety of community life indicators document the importance of viable agriculture to the viability of communities.

It is also important to note that other indicators, such as the market value of poultry, and the percentage of land in agriculture do not show such viability. Thus, the specific types and structures of agriculture are important for keeping viable communities, and not simply "any agriculture," or "agriculture in general."

Naturally further research should and will be initiated on this important issue. First, more indicators of a viable agriculture will undergo an analysis similar to the one presented here. Moreover, similar analyses must also disaggregate the data by county type in order to discover whether the data here appear because of the ecological correlations of using disparate types of counties in the analysis set. For instance, it may be

that it is the urban to rural dimension which underlies all the correlations, so that to consider only the rural counties or only the urban counties could possibly change these results.

Still, on the basis of the above analyses, it must be asserted that Goldschmidt's (1946) hypothesis can now be extended from being supported by only two cases in California, to being supported by 196 cases in the Northeast United States.

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